On March 31, 2003, Tim Lohner e-mailed the following notes to Paula Smith concerning an AEP staff member who attended the February 26-27, 2003 International Joint Commission conference. Tim writes:

Paula, one of our staff members (Rob Reash) attended the February 26-27 International Joint Commission conference on "An Ecosystem Approach to the Health Effects of Mercury in the Great Lakes Basin", held in Windsor, Ontario. The following are some of his notes from the conference, which I believe the workgroup may find helpful. Use your own discretion in deciding whether or not to share it with the workgroup.

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As in other IJC meetings, the attendance consisted mostly of regulatory, policy, and environmental group representatives. The following is a summary of the key talks and points made.

Ecosystem Studies

Marc Lucotte (Canadian Collaborative Mercury Research Network). The research network, a consortium of over 60 Canadian universities, was formed to coordinate ecosystem research studies on Hg in Canada. Lucotte summarized findings of studies in various provinces.

Lucotte immediately stirred controversy by saying that, based on research he has conducted, there is no simple, predictable relationship between mercury-emitting sources and mercury levels in fish. Not only is the response time between atmospheric loading reductions and changes in fish Hg levels not linear, any resulting changes would take many decades ("100 years or so"). While he did acknowledge that total Hg loadings to a watershed can be a factor in determining fish Hg levels, he stressed that four other factors were more important: waterbody-specific characteristics, watershed land use and terrestrial sources of mercury, trophic ecology of the fish community, and the degree of fishing intensity. When questioned aggressively by researchers and environmentalists on the policy implications of his position, Lucotte did not waiver from his thesis, saying that while reductions in Hg atmospheric releases should be made to the extent possible, there should be no expectation that the reductions will cause immediate, predictable, significant reductions in fish Hg levels.

Great Lakes Sediments

Ron Rossman (U.S. EPA) provided a summary of research on historic trends of Hg levels in sediments from the Great Lakes. He said that locations with highest sediment Hg levels (sites that cause impairment) are those that have been affected by historical point-sources or runoff activities: cinnabar mining sites along Lake Superior, chloro-alkali facilities on Lake St. Clair, large POTW facilities. During the past 100 years, all of the Great Lakes indicate declining Hg levels in sediments. Within all lakes, highest sediment Hg levels were observed in the 1950 - 1970 period. Currently, Lake Ontario has the highest Hg levels, Lake Erie the 2nd highest, and other lakes have lowered levels. Rossman indicated that, at least for Lake Michigan, levels of methylmercury in sediments do not parallel levels of total Hg. This is because methylation rates in sediments tend to be higher at some locations relative to others, depending on depth, substrate chemistry, and water quality.

Atmospheric Chemistry

Mark Cohen (NOAA) presented results of NOAA's new Hg dispersion and deposition model (HYSPLIT) applied to the Great Lakes. He emphasized the many uncertainties in modeling Hg over a wide geographic area: unknown emission speciation, lack of reliable deposition monitoring stations to calibrate the model, complex source-receptor relationships. Using emission and deposition data for year 1996, NOAA's model predicted that 10 - 20% of all Hg entering the Great Lakes basin is from global sources. For individual lakes, Lake Michigan has the highest Hg deposition; Lake Ontario has the lowest. For lakes Superior and Michigan, model results show that about 80% of the Hg loading to the basins are from atmospheric sources. For Lake Superior, the majority of Hg loadings in the basin were estimated to come from within a 400 km-wide concentric area. Cohen's talk was fair in characterizing the preliminary results of the modeling, and pointing out the many data gaps and modeling uncertainties. One point he did make was that every updated emission inventory showed higher cumulative emissions than earlier estimates. This is because many sources are being quantified for the very first time. Emission inventories, thus, are quickly outdated.

EPA Viewpoint

Frank Anscombe (U.S. EPA Region V) gave a rather balanced, technically accurate review of the mercury contamination problem from a domestic and global perspective. He described the very successful Hg release reduction efforts of chloro-alkali facilities in the Great Lakes basin. He stated, somewhat surprisingly from an EPA official, that between 1/3 and 2/3 of total global releases of Hg are from natural sources. This estimate agrees with studies conducted by EPRI. He stated that all Hg that ends up in waterbodies does not necessarily become methylated, and that some methylmercury already formed is subsequently demethylated. While stating that mercury levels in the U.S. have generally declined during the past 30 years, he warned that worldwide increases in energy demand - depending on the fuel used to produce the energy - could increase Hg emissions. Anscombe mentioned the Clear Skies Initiative as one option that would reduce Hg emissions from utilities.

Wildlife Studies

Michael Meyer (Wisconsin DNR) summarized two different studies conducted with common loons, a fish-eating waterbird that is thought to incur reproductive effects when exposed to mercury in the food chain. The common loon is the one wildlife species that environmentalists and regulatory agencies continually cite as "proof" that elevated mercury levels are causing pervasive impacts on wild populations of fish-eating birds and mammals. Thus, study results for this species are important to review. Relative to other fish-eating birds, loons clearly have the highest levels of mercury in their feathers and other tissue. Other fish-eating birds, however, are doing quite well in the Great Lakes. Bald eagle, cormorant, osprey, and herring gull populations have been increasing for several decades, and in no instance has mercury been implicated as the sole contaminant causing effects to a particular species.

Meyer first reported on field studies conducted in Wisconsin and the Canadian Maritimes. Loons from Nova Scotia and New Brunswick had higher Hg levels in their tissues compared to loons from northern Wisconsin. The eastern Canadian lakes, however, were more acidic than the Wisconsin lakes (which themselves are more acidic than most lakes in the region). For all lakes combined, loon prey fish Hg levels were highest in acidic lakes. Meyer noted that there was a weak correlation between loon reproductive success and lake pH. What all this means is that Hg is more bioavailable (loons have higher Hg tissue levels) in more acidic lakes (no surprise to anyone), and that effects caused by Hg alone are impossible to discover because if the lakes were not acidic, the loons would likely have much lower tissue levels.

On a related issue, Meyer discussed how Hg levels in adult loons - captured in 1992 and recaptured in 2000 - showed decreasing levels of Hg in blood and feathers. The average annual rate of decline was 5%. This lowered exposure of loons to Hg, in addition to other findings in northern Wisconsin lakes showing lower levels of Hg in fish and water, is certainly encouraging. Some regulatory scientists and environmentalists have claimed that these findings "demonstrate" how control of upwind mercury stationary sources can lead to "rapid" environmental benefits, thus a more-or-less direct relationship between Hg emission reductions and lowered environmental levels could be expected for other geographic regions. This is an incorrect conclusion, however. First, the researchers were unable to identify any significant local or regional upwind combustion sources from these lakes. Second, lowered Hg levels in these lakes are likely the result of lowered acidity (higher pH) levels in the lakes seen during the past 10 years due to lowered sulfate deposition. Thus, an extrapolation from these studies to other regions is not valid.

Meyer also discussed the results of a study jointly funded by Wisconsin DNR, EPRI, and Wisconsin utilities. In this study, loons from different lakes in Wisconsin were captured and allowed to breed in a laboratory setting. Chicks from randomly selected nests were fed diets either with no methlymercury or with low, medium, or high levels of methylmercury. As the chicks matured, a battery of biological tests were conducted to determine any immediate or delayed health effects. Surprisingly, no effects were observed in any chicks fed the methylmercury-contaminated diet, even at the highest dose. While the researchers are still interpreting these results, it may be that any harmful effects seen in wild loon populations are a result of site-specific conditions (namely acidic water that promotes unusually high Hg bioaccumulation).